UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,877	11/26/2003	Junjie Gu	P8940	9330

66083 7590 06/11/2007

SUN MICROSYSTEMS, INC. c/o DORSEY & WHITNEY, LLP
370 SEVENTEENTH ST.
SUITE 4700
DENVER, CO 80202

EXAMINER	
NGUYEN, PHILLIP H	

ART UNIT	PAPER NUMBER
2191	

MAIL DATE	DELIVERY MODE
06/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/723,877	GU, JUNJIE	
	Examiner	Art Unit	
	Phillip H. Nguyen	2191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-11 and 13-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 April 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the amendment filed on 4/11/2007.

2. Per Applicant's request, claims 1-3, 7-9 and 13-18 have been amended. Claims 1-18 remain pending and have been considered below.

Response to Arguments

3. Applicant's arguments with respect to claims 1-5, 7-11 and 13-17 have been considered but are moot in view of the new ground(s) of rejection.

Specification

4. The amendment filed on 4/11/2007 overcomes the objection set forth to the specification of previous action. Therefore, the objection is withdrawn.

Claim Objections

5. The amendment filed on 4/11/2007 overcomes the objection set forth to claims 14-18 or previous action. Therefore, the objection is withdrawn.

Claim Rejections - 35 USC § 112

6. The amendment filed on 4/11/2007 overcomes the objection set forth to claims 3, 4, 9, 10, 15 and 16 of previous action. Therefore, the rejection is withdrawn.

Allowable Subject Matter

7. Claims 6, 12, 18 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-5, 7-11 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carini et al. (United States Patent No.: US 5,740,443), in view of Arnold et al. (United States Patent No.: US 6,971,091 B1).

As per claim 1:

Carini discloses:

- analyzing said source program comprising procedures to generate a call graph of said source program, wherein each of said procedures has a first known execution frequency (see at least col. 7, line 51 "**construct the program call graph PCG**");
- using said call graph in conjunction with inlining plans by an inlining method to generate an inlined version of said source program wherein one or more selected

call sites have been inlined (see at least col. 8, lines 11-12 "**Each procedure is visited, the inlining inputs are collected and an intermediate representation is generated**"); and

- using said updated execution frequency for each of said procedures to generate optimized executable code for said sour program (see at least col. 9, lines 28-29 "**optimized code is generated for this procedure**").

Carini does not explicitly disclose:

- after generating an inlined version of said source program, generating an updated execution frequency for each of procedures.

However, Arnold discloses an analogous method performing:

- after generating an inlined version of said source program, generating an updated execution frequency for each of procedures (see at least col. 15, lines 3-20 "**when a thread switch occurs in a method prologue, the system calls the update method of an edge listener...After updating the weights in the dynamic call graph, the DCG organizer clears the buffer...**").

Therefore, it would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify Carini's approach to update the weights in the graph. One would have been motivated to update the weights in the graph and pass the information to the optimization compiler to generate optimized code.

As per claim 2:

Carini further discloses:

- wherein said inlining method further comprises using heuristics (see at least col. 7, line 55 "**IPA input are collected and saved for later use**" – heuristics) to calculate cost/benefit ratios for calls in said procedures of said source program to generate a ranking of said call sites (see at least col. 9, line 41 "**short and simple or complex**"; also see at least col. 9, line 43 "**high cost and lower cost**").

As per claim 3:

Carini discloses:

- wherein said inlining mehod further comprises using said ranking cost/benefit ratios to select calls in said procedure for inlining (see at least col. 9, lines "39-42 "**the routines cost function determines the suitability of a particular procedure for inlining at any call site and enhances the selection of procedures which are typically short and simple**").

As per claim 4:

Carini discloses:

- wherein said selected calls are inlined until a predetermined resource limit has been reached, wherein said predetermined resource limits (**such as threshold values**) part of said heuristic (see at least col. 9, lines 60-68; col. 10, lines 1-10).

As per claim 5:

Arnold further discloses:

- updated execution frequency is computed each time any of said call sites is determined to be inlined (see at least col. 15, lines 3-20 "**when a thread switch occurs in a method prologue, the system calls the update method of an edge listener...After updating the weights in the dynamic call graph, the DCG organizer clears the buffer...**").

As per claim 7:

Carini discloses:

- providing a compiler system configured to accept said source program and to output binary code representing said source program which is capable of being processed of said computer architecture, said compiler system comprising:
- a front end portion (**It is inherent in Carini's compiler system that a front end portion must exist in order to check syntax and detect errors before the source code fetched to the code optimizer**),
- code optimizer portion (see col. 7, line 19 "**optimizer 106**"); and
- a back end code generator (see at least col. 8, line 12 "**intermediate representation is generated**" – backend portion generates intermediate presentation);
- providing said code optimizer portion of said compiler system configured to accept intermediate code from said front end portion of said compiler system and

to analyze said source program comprising procedures to generate a call graph of said source program wherein each of said procedures has a first known execution frequency (see at least col. 7, line 51 "**construct the program call graph PCG**");

- using said call graph in conjunction with inlining plans by an inlining method in said code optimizer to generate an inlined version of said source program, wherein one or more selected call sits have been inlined (see at least col. 8, lines 11-12 "**Each procedure is visited, the inlining inputs are collected and an intermediate representation is generated**");
- using said code optimizer to generate an intermediate optimized code version of said source program by processing said inlined source program with said updated execution frequency (see at least col. 9, lines 28-29 "**optimized code is generated for this procedure**"); and
- providing said intermediate optimized code to a back-end code generator to generate optimized binary code (object code) for said source program (see at least col. 9, line 10 "**Generate object code**").

Carini does not explicitly disclose:

- after generating an inlined version of said source program, using said code optimizer to generate an updated execution frequency for said procedure.

However, Arnold discloses an analogous method performing:

- after generating an inlined version of said source program, using said code optimizer to generate an updated execution frequency for said procedure (see at

least col. 15, lines 3-20 "**when a thread switch occurs in a method prologue, the system calls the update method of an edge listener...After updating the weights in the dynamic call graph, the DCG organizer clears the buffer...**"). Therefore, it would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify Carini's approach to update the weights in the graph. One would have been motivated to update the weights in the graph and pass the information to the optimization compiler to generate optimized code.

As per claim 8:

Carini further discloses:

- wherein said inlining method further comprises using heuristics (see at least col. 7, line 55 "**IPA input are collected and saved for later use**" – heuristics) to calculate cost/benefit ratios for calls in said procedures of said source program to generate a ranking of said call sites (see at least col. 9, line 41 "**short and simple or complex**"; also see at least col. 9, line 43 "**high cost and lower cost**").

As per claim 9:

Carini discloses:

- wherein said inlining mehod further comprises using said ranking cost/benefit ratios to select calls in said procedure for inlining (see at least col. 9, lines "39-42 "**the routines cost function determines the suitability of a particular**

procedure for inlining at any call site and enhances the selection of procedures which are typically short and simple").

As per claim 10:

Carini discloses:

- wherein said selected calls are inlined until a predetermined resource limit has been reached, wherein said predetermined resource limits (**such as threshold values**) part of said heuristic (see at least col. 9, lines 60-68; col. 10, lines 1-10).

As per claim 11:

Arnold further discloses:

- updated execution frequency is computed each time any of said call sites is determined to be inlined (see at least col. 15, lines 3-20 "**when a thread switch occurs in a method prologue, the system calls the update method of an edge listener...After updating the weights in the dynamic call graph, the DCG organizer clears the buffer...**").

As per claim 13:

Carini disclose::

- central processing unit (CPU) (see FIG. 4, item 116);
- random access memory (RAM) (see FIG. 4, item 114) coupled to said CPU, for use in compiling a source program to run on said computer system, said source

program comprising procedures (see at least col. 7, line 54 "...**each procedure in the program**");

- accept intermediate code from said front end portion of said compiler system and to analyze said source program to generate a call graph of said source program wherein each of said procedures has a first known execution frequency (see at least col. 7, line 51 "**construct the program call graph PCG**");
- process said call graph in conjunction with inlining plans by an inlining method to generate an inlined version of said source program wherein one or more selected call sites have been inlined (see at least col. 8, lines 11-12 "**Each procedure is visited, the inlining inputs are collected and an intermediate representation is generated**");
- generate an intermediate optimized code version of said source program by processing said inlined source program with said updated execution frequency for each of said procedures (see at least col. 9, lines 28-29 "**optimized code is generated for this procedure**"); and
- provide said intermediate optimized code to a back-end code generator (see at least col. 9, line 10 "**Generate object code**"); and
- wherein said back-end code generator is operable to generate optimized binary code (object code) for said source program for execution by said central processing unit (see at least col. 9, line 10 "**Generate object code**").

Carini does not explicitly disclose:

- after generating an inlined version of said source program, generate an updated execution frequency for each of said procedures.

However, Arnold discloses an analogous system performing:

- after generating an inlined version of said source program, generate an updated execution frequency for each of said procedures (see at least col. 15, lines 3-20 "**when a thread switch occurs in a method prologue, the system calls the update method of an edge listener...After updating the weights in the dynamic call graph, the DCG organizer clears the buffer...**").

Therefore, it would have been obvious to one having an ordinary skill in the art at the time the invention was made to modify Carini's approach to update the weights in the graph. One would have been motivated to update the weights in the graph and pass the information to the optimization compiler to generate optimized code.

As per claim 14:

Carini further discloses:

- wherein said inlining method further comprises using heuristics (see at least col. 7, line 55 "**IPA input are collected and saved for later use**" – heuristics) to calculate cost/benefit ratios for calls in said procedures of said source program to generate a ranking of said call sites (see at least col. 9, line 41 "**short and simple or complex**"; also see at least col. 9, line 43 "**high cost and lower cost**").

As per claim 15:

Carini discloses:

- wherein said inlining mehod further comprises using said ranking cost/benefit ratios to select calls in said procedure for inlining (see at least col. 9, lines "39-42 "**the routines cost function determines the suitability of a particular procedure for inlining at any call site and enhances the selection of procedures which are typically short and simple**").

As per claim 16:

Carini discloses:

- wherein said selected calls are inlined until a predetermined resource limit has been reached, wherein said predetermined resource limits (**such as threshold values**) part of said heuristic (see at least col. 9, lines 60-68; col. 10, lines 1-10).

As per claim 17:

Arnold further discloses:

- updated execution frequency is computed each time any of said call sites is determined to be inlined (see at least col. 15, lines 3-20 "**when a thread switch occurs in a method prologue, the system calls the update method of an edge listener...After updating the weights in the dynamic call graph, the DCG organizer clears the buffer...**").

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phillip H. Nguyen whose telephone number is (571) 270-1070. The examiner can normally be reached on Monday - Thursday 10:00 AM - 3:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wei Y. Zhen can be reached on (571) 272-3708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PN
6/1/2007

WEI ZHEN
SUPERVISORY PATENT EXAMINER